Waveguide Voltage Reflection Calibrations of the MXK Cone (Modification 1)

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A listing of reflection coefficients for the multiple-frequency X- and K-band (MXK) cone (Mod. 1), at both X- and K-band frequencies, is presented. Included is a short discussion of the measurement technique and results.

I. Introduction

This article presents a summary of reflection coefficient measurements made on the MXK cone waveguide system during the final assembly stages of the updated cone. These measurements were made on the ground at JPL and the Goldstone DSCC. Both the X-band (8.5 GHz) and K-band (15.3 GHz) systems were tested. Adequate calibration, checkout and long-term monitoring of the cone performance require accurate knowledge of the initial radio-frequency match at selected points in the waveguide system. The block diagrams of the MXK Mod. 1 cone system for both frequency systems are identical.[1]

II. Results

One criterion for RF matching is the transfer of maximum energy into the traveling wave maser (TWM). With this in mind, all the measurements listed here were made at port ⚠ (Fig. 4 of Reid's article) in both frequency systems. With one exception, all match measurements were made with a high-precision tuned reflectometer. The exception is that the ambient termination for the K-band system was tuned and measured in a broad-band mode over the frequency range of 15.0 to 15.5 GHz. This is because this termination will be used at a number of frequencies in this band, and therefore narrow-band tuning of the termination will not suffice. Similar reasoning applies to the ambient termination for the X-band system. However, this system was measured at the Goldstone DSCC, and swept frequency techniques were not available; therefore, it was only measured at a single frequency *in situ*. Manufacturers' data on this X-band termination *at its flange* is included.

Tables 1 and 2 show voltage reflection coefficients at K-band and X-band, respectively.

[1]Refer to Fig. 4 of "Improved RF Calibration Techniques: System Operating Noise Temperature Calibrations" by M. S. Reid in this issue.

Table 1. Voltage reflection coefficients MXK cone (K-band system)

Item measured	15.3 GHz
TWM	0.126
Main feed horn	0.016
Reference feed horn	0.038
Ambient load (swept-over frequency 15.0 to 15.5 GHz)	0.018 to 0.013

Table 2. Voltage reflection coefficients MXK cone (X-band system)

Item measured	7850 MHz	8427 MHz	8448 MHz
TWM	0.260	0.186	
Main horn			
RCP	0.062	0.059	
LCP	0.060	0.065	
LP	0.079	0.086	
Ambient load	0.007	0.012	
(Manufacturers' data at load flange)	0.006	0.012	0.010